

Environmental Protection Agency

§ 1048.510

(2) For engines from an engine family that will be used only at a single, rated speed, use the 5-mode duty cycle or the corresponding ramped-modal cycle described in 40 CFR part 1039, Appendix II, paragraph (a).

(3) Use a duty cycle from both paragraphs (b)(1) and (b)(2) of this section if you will not restrict an engine family

to constant-speed or variable-speed applications.

(4) Use a duty cycle specified in paragraph (b)(2) of this section for all severe-duty engines.

(5) For high-load engines, use one of the following duty cycles:

(i) The following duty cycle applies for discrete-mode testing:

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Mode No.	Engine speed	Torque (percent) ¹	Minimum time in mode (minutes)	Weighting factors
1	Maximum test speed	100	3.0	0.50
2	Maximum test speed	75	3.0	0.50

¹ The percent torque is relative to the maximum torque at maximum test speed.

(ii) The following duty cycle applies for discrete-mode testing:

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RMC modes	Time in mode (seconds)	Engine speed (percent)	Torque (percent) ^{1,2}
1a Steady-state	290	Engine governed	100
1b Transition	20	Engine governed	Linear transition.
2 Steady-state	290	Engine governed	75

¹ The percent torque is relative to maximum test torque.

² Advance from one mode to the next within a 20-second transition phase. During the transition phase, command a linear progression from the torque setting of the current mode to the torque setting of the next mode.

(c) If we test an engine to confirm that it meets the duty-cycle emission standards, we will use the steady-state duty cycles that apply for that engine family.

(d) During idle mode, operate the engine at its warm idle speed as described in 40 CFR 1065.510.

(e) For full-load operating modes, operate the engine at wide-open throttle.

(f) See 40 CFR part 1065 for detailed specifications of tolerances and calculations.

(g) For those cases where steady-state testing does not directly follow a transient test, perform the steady-state test according to this section after an appropriate warm-up period, consistent with 40 CFR part 1065, subpart F.

[73 FR 59239, Oct. 8, 2008, as amended at 75 FR 23022, Apr. 30, 2010]

§ 1048.510 What transient duty cycles apply for laboratory testing?

(a) Starting with the 2007 model year, measure emissions by testing the en-

gine on a dynamometer with the duty cycle described in Appendix II to determine whether it meets the transient emission standards in § 1048.101(a).

(b) Calculate cycle statistics and compare with the established criteria as specified in 40 CFR 1065.514 to confirm that the test is valid.

(c) Warm up the test engine as follows before running a transient test:

(1) Operate the engine for the first 180 seconds of the appropriate duty cycle, then allow it to idle without load for 30 seconds. At the end of the 30-second idling period, start measuring emissions as the engine operates over the prescribed duty cycle. For severe-duty engines, this engine warm-up procedure may include up to 15 minutes of operation over the appropriate duty cycle.

(2) If the engine was already operating before a test, use good engineering judgment to let the engine cool down enough so measured emissions during the next test will accurately represent those from an engine starting at room temperature. For example,

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if an engine starting at room temperature warms up enough in three minutes to start closed-loop operation and achieve full catalyst activity, then minimal engine cooling is necessary before starting the next test.

(3) You are not required to measure emissions while the engine is warming up. However, you must design your emission-control system to start working as soon as possible after engine starting. In your application for certification, describe how your engine meets this objective (see § 1048.205(b)).

[67 FR 68347, Nov. 8, 2002, as amended at 70 FR 40478, July 13, 2005; 73 FR 59241, Oct. 8, 2008; 75 FR 23023, Apr. 30, 2010]

§ 1048.515 What are the field-testing procedures?

(a) This section describes the procedures to determine whether your engines meet the field-testing emission standards in § 1048.101(c). These procedures may include any normal engine operation and ambient conditions that the engines may experience in use. Paragraph (b) of this section defines the limits of what we will consider normal engine operation and ambient conditions. Use the test procedures we specify in § 1048.501, except for the provisions we specify in this section. Measure emissions with one of the following procedures:

(1) Remove the selected engines for testing in a laboratory. You may use an engine dynamometer to simulate normal operation, as described in this section.

(2) Test the selected engines while they remain installed in the equipment. In 40 CFR part 1065, subpart J, we describe the equipment and sampling methods for testing engines in the field. Use fuel meeting the specifications of 40 CFR part 1065, subpart H, or a fuel typical of what you would expect the engine to use in service.

(b) An engine's emissions may not exceed the levels we specify in § 1048.101(c) for any continuous sampling period of at least 120 seconds under the following ranges of operation and operating conditions:

(1) Engine operation during the emission sampling period may include any normal operation, subject to the following restrictions:

(i) Average power must be at least 5 percent of maximum brake power.

(ii) Continuous time at idle must not be greater than 120 seconds.

(iii) The sampling period may not begin until the engine has reached stable operating temperatures. For example, this would exclude engine operation after starting until the thermostat starts modulating coolant temperature.

(iv) The sampling period may not include engine starting.

(v) For engines that qualify for the alternate Tier 2 emission standards in § 1048.101(d), operation at 90 percent or more of maximum power must be less than 10 percent of the total sampling time. You may request our approval for a different power threshold.

(2) Engine testing may occur under any normal conditions without correcting measured emission levels, subject to the following restrictions:

(i) Barometric pressure must be between 80.0 and 103.3 kPa (600 and 775 mm Hg).

(ii) Ambient air temperature must be between 13° and 35 °C.

[67 FR 68347, Nov. 8, 2002, as amended at 70 FR 40478, July 13, 2005; 73 FR 59241, Oct. 8, 2008]

Subpart G—Compliance Provisions

§ 1048.601 What compliance provisions apply to these engines?

(a) Engine and equipment manufacturers, as well as owners, operators, and rebuilders of engines subject to the requirements of this part, and all other persons, must observe the provisions of this part, the requirements and prohibitions in 40 CFR part 1068, and the provisions of the Act.

(b) This paragraph (b) describes how the replacement-engine provisions of 40 CFR 1068.240 apply for engines subject to the requirements of this part in conjunction with the secondary engine manufacturer provisions in 40 CFR 1068.262. For cases in which the secondary engine manufacturer completes assembly of the engine, these provisions apply as written. If the secondary engine manufacturer arranges for a